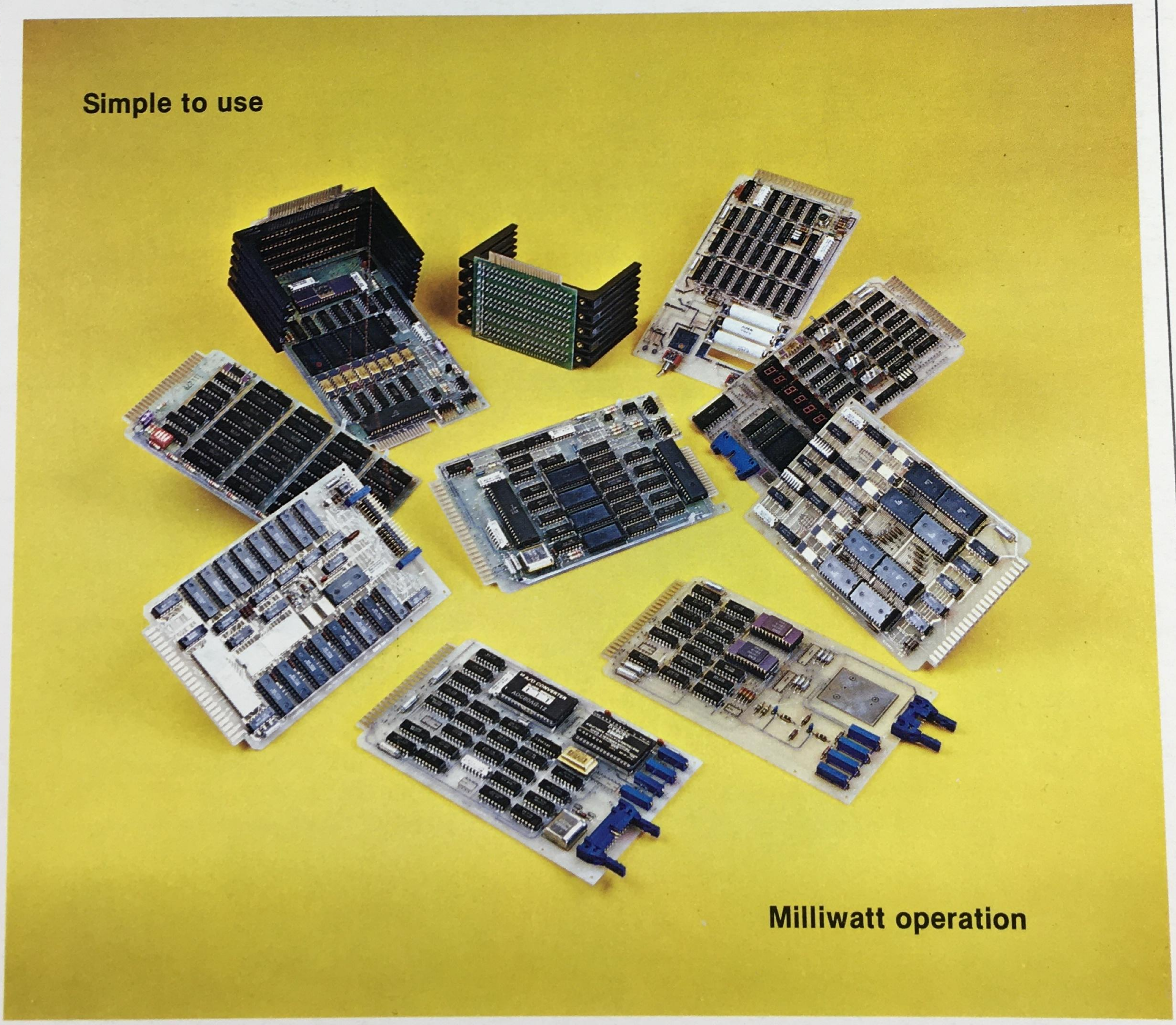
RCA Solid State

COSMAC Microboard Computer Systems


Simple to use

Milliwatt operation

CMB-250A

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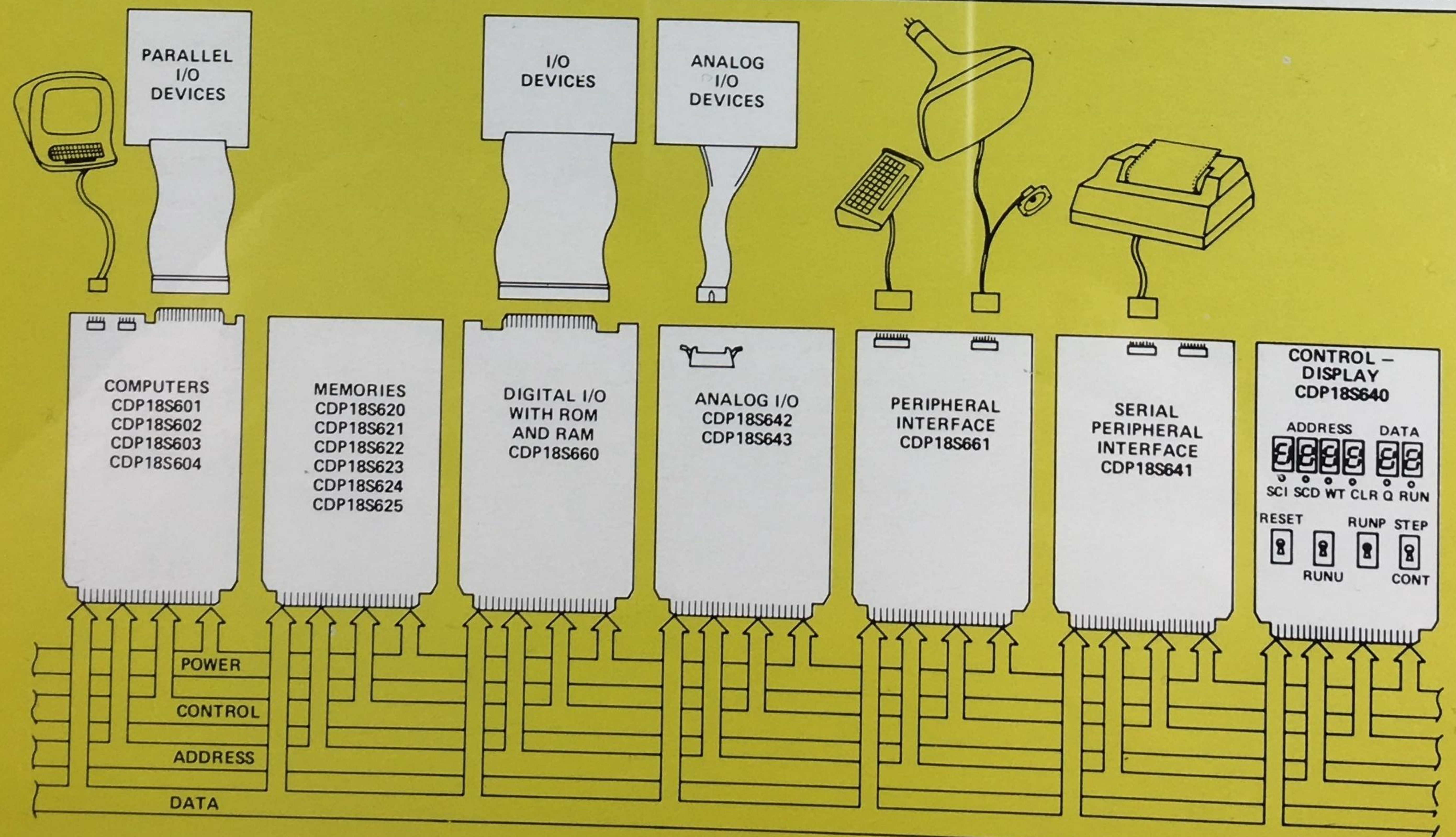

Microboard System Block Diagram

**For designers of microprocessor-based equipment . . .
A fully coordinated line of
Ready-to-use hardware for custom applications.**

The RCA CMOS Microboard Milliwatt Computer Systems

The CDP18S600 Series

- **Simple to Use**

  Simply select the 4.5x7.5-inch (114.3x190.5 mm) Microboard modules your system needs, plug them on to the Microboard 5- or 25-card chassis with COSMAC Microboard Universal Backplane, and add a milliwatt power supply. You are ready to begin the development of the software for your application. No hand-wired breadboards, no hardware headaches, no design delays.

- **Low-Power Operation**

  Utilizing all CMOS components, your RCA COSMAC Microboard system can be powered from a small supply, a wall supply, or even a battery. The integral battery option of the Microboard 8K RAM can be used to power the entire system.

- **Low-Cost Power Supply**

  The low power requirements of the Microboard modules coupled with their wide operating-range capabilities allow use of low-cost power supplies having extended regulation limits. No longer does the power supply have to be bigger, bulkier, and heavier than the entire system. And you eliminate cooling fans along with associated reliability hazards.

- **Compact Universal Bus**

  Only 44 pins; a most compact, efficient, highly flexible backplane. With the COSMAC Microboard Universal Backplane, any Microboard module works in any location. Use the broad selection of readily interchangeable Microboard modules. Simply exchange or add modules to match your changing design requirements. Lots of flexibility without hardware design headaches.

- **Excellent Noise Immunity**

  CMOS technology provides reliable operation in high-noise process-control, automotive, and production-monitoring environments. No ground plane or extra decoupling capacitors needed.

- **Development System Capability**

  All Microboard modules are designed to plug directly into RCA COSMAC Development Systems to facilitate rapid hardware and software development. The RCA COSMAC DOS Development System CDP18S007 provides Editor, Macroassembler, Utility, and many other programs for the neophyte-to-expert software designer. And RCA provides ample technical literature and field engineering support.

- **100% Testing and Burn-In**

  All Microboard modules are functionally tested after manufacture, subjected to a 72-hour, 5-volt burn-in at 70 °C, and then functionally retested to assure reliable operation.

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All low-power static CMOS

Microboard Computers

CDP18S601, CDP18S602, CDP18S603, CDP18S604

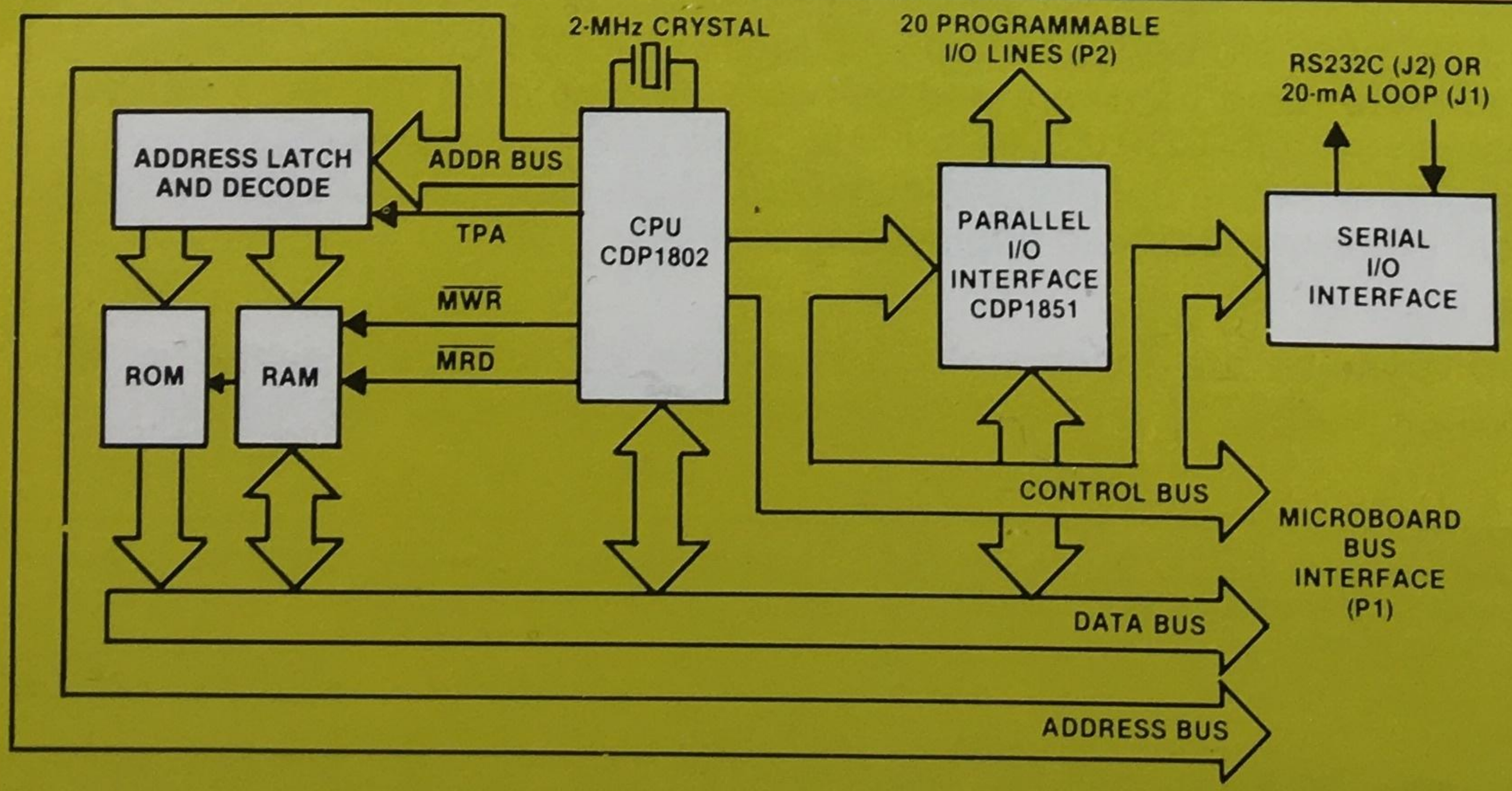
These types are complete computer systems on single 4.5" × 7.5" cards. Each contains a CDP1802 CPU, a crystal-controlled clock, read-write memory, parallel I/O ports, a serial communications interface, power-on reset, an expansion interface, and sockets for user-selected read-only memory. These Microboard computers have all the inherent advantages of low-power static CMOS components and COSMAC Microprocessor architecture. Used with a single 5-volt supply, they require only 4 to 10 mA when operated without EPROM or 20-mA loop terminal interface.*

Features:

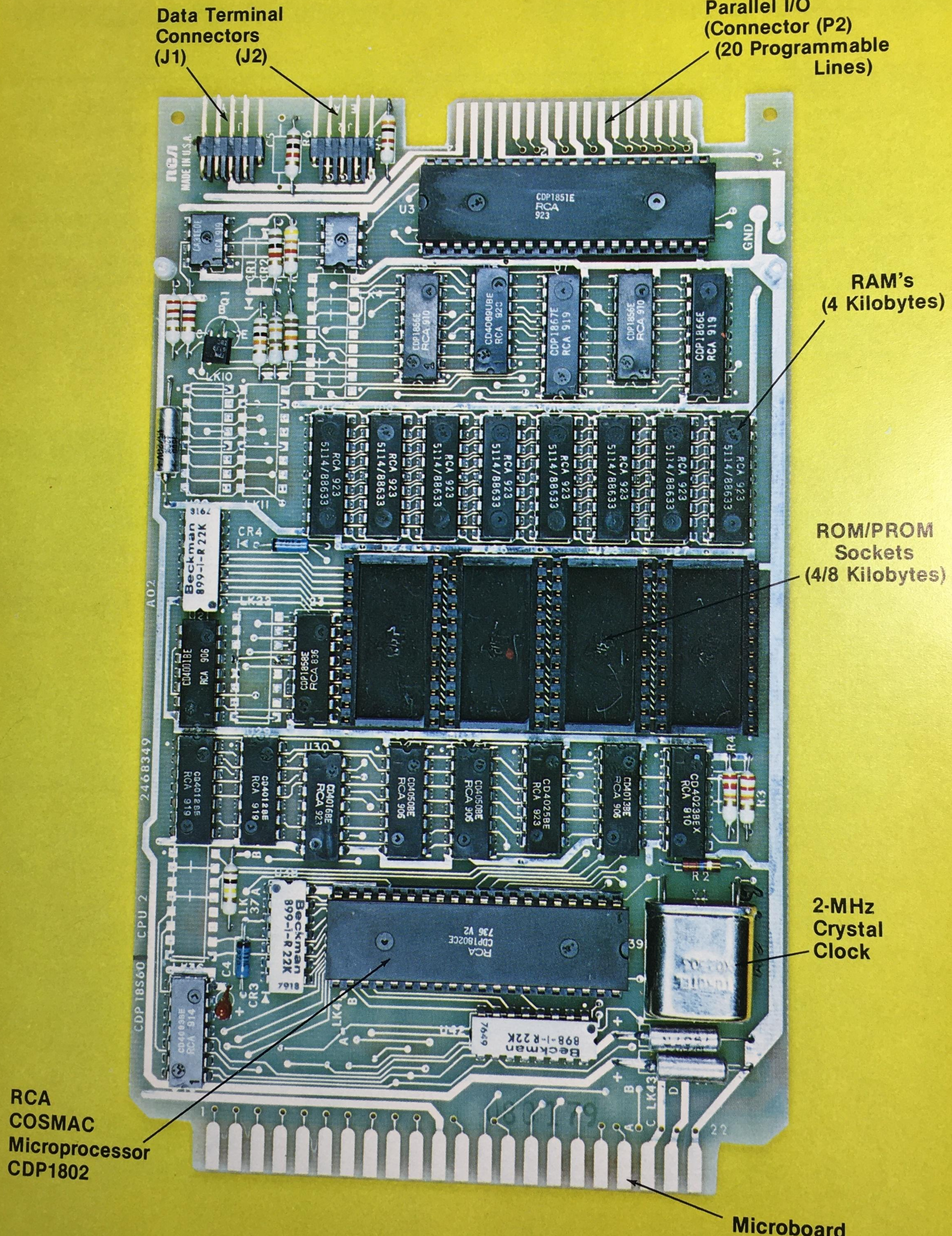
- Over 20 parallel I/O lines
- RS232C or 20 mA serial I/O (except CDP18S604)
- 4 flag inputs; Q serial data output
- All I/O lines on edge connectors
- Compatible with CDP18S005 or CDP18S007 COSMAC Development Systems
- Expandable by use of COSMAC Microboard Universal Backplane
- Powered through either expansion connector or I/O connector
- High noise immunity

Microboard Computer	Clock Frequency (MHz)	RAM (bytes)	ROM (bytes)	Serial I/O Port	I/O Lines	Power* (V)	(mA)
CDP18S601	2	4K	4K (CDP1834) 4K (2708) 4K (2758) 8K (2716)	Software-driven; Q output; flag input	25: 20 programmable I/O (CDP1851); 4 flag inputs, 1 Q output	+5	10
CDP18S602	Selectable: 2.4576, 1.2288, 0.6144, or 0.3072	2K	2K (CDP1834) 2K (2758) 4K (2716)	UART: 14 selectable baud rates from 50 to 19200 baud	21: 8 inputs (CDP1852), 8 outputs (CDP1852), 4 flag inputs, 1 Q output	+5	8
CDP18S603	2	1K	4K (CDP1834) 4K (2708) 4K (2758) 8K (2716)	Software-driven; Q output; flag input	25: 20 programmable I/O (CDP1851); 4 flag inputs; 1 Q output	+5	7
CDP18S604	2	512	1K (CDP1834) 1K (2758) 2K (2716)	Software-driven; Q output; flag input	21: 8 inputs (CDP1852), 8 outputs (CDP1852), 4 flag inputs, 1 Q output	+5	4

*Typical values; running RS232C interface and no EPROM's. RS232C interface requires +12 to +15 V at 6 mA and −5 to −15 V at 3 mA. Loop interface draws an additional 20 mA from the +5 V supply. CDP18S604 does not have RS232C or 20-mA interface.



Block diagram of RCA CDP18S601 and CDP18S603 Microboard Computers


Data Terminal Connectors
(J1)
(J2)
Parallel I/O (Connector (P2) (20 Programmable Lines)
RAM's (4 Kilobytes)
ROM/PROM Sockets (4/8 Kilobytes)
2-MHz Crystal Clock
RCA COSMAC Microprocessor CDP1802
Microboard Universal Backplane Connector (P1)

CDP18S601 Microboard Computer
(Actual Size)

Microboard Memories

CDP18S620 4-Kilobyte RAM
CDP18S621 16-Kilobyte RAM
CDP18S621V1 16-Kilobyte RAM
CDP18S622 8-Kilobyte Battery-Backup RAM
CDP18S623 8-Kilobyte RAM
CDP18S624 4-Kilobyte Battery-Backup RAM
CDP18S625 8/16/32-Kilobyte ROM/PROM

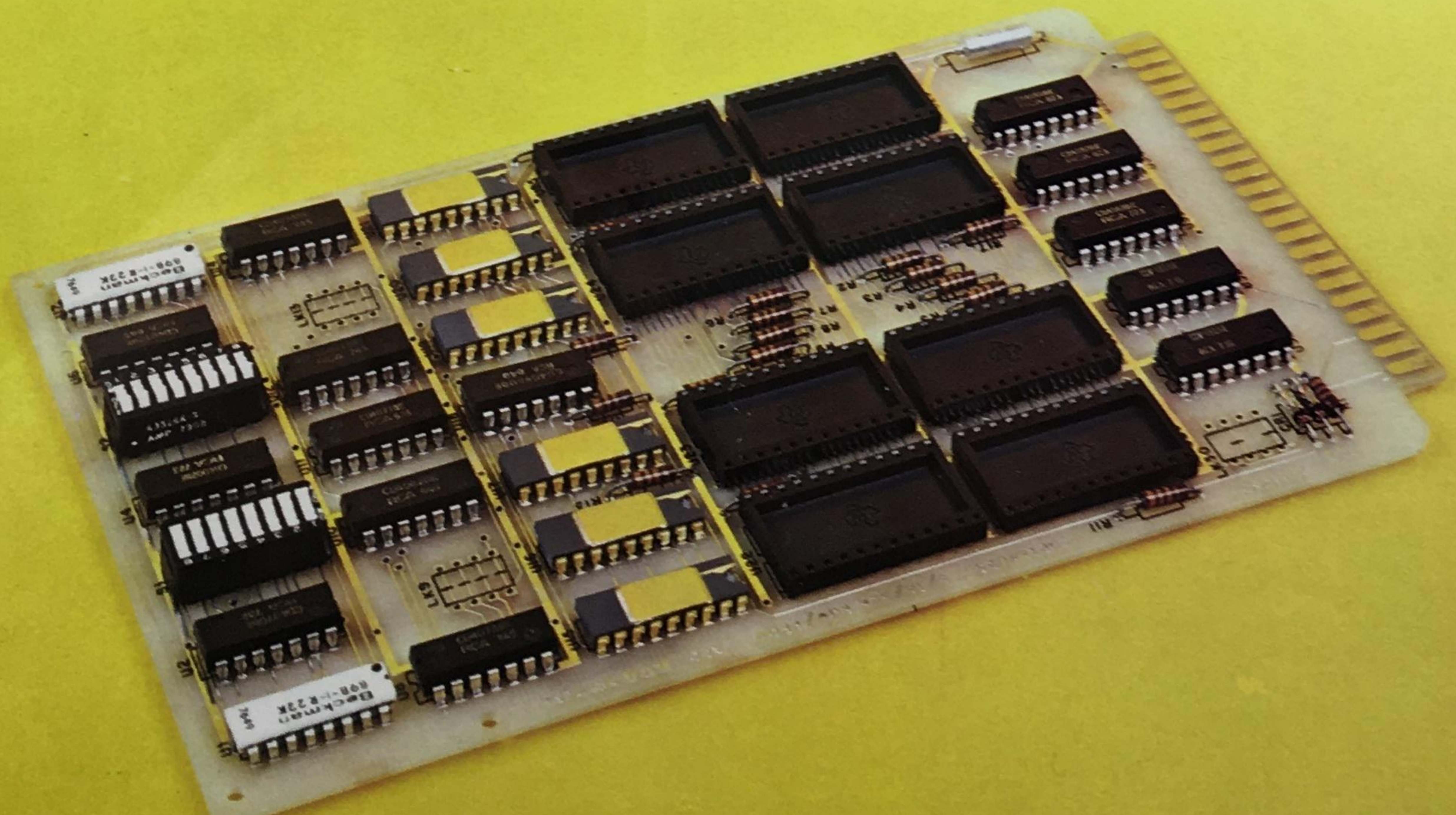
Features:

- Low-power static CMOS
- Small size (4.5 × 7.5 inches)
- Member of extensive Microboard family
- Compatible with COSMAC Development Systems
- Fit Micromonitor CDP18S030 memory expansion connector
- High noise immunity
- Flexible address assignment
- Fully buffered
- 0 to 70°C temperature range
- Simple system interface
- Operation from single 5-volt supply

	Memory		Data	Operation	
Microboard	Type	Bytes	Retention	Power (typ.)	
CDP18S620	Static CMOS RAM	4K	—	5 V	4 mA
CDP18S621		16K	—	5 V	6 mA
CDP18S621V1		16K	—	5 V	11 mA
CDP18S622		8K	96h	5 V	13 mA*
CDP18S623		8K	—	5 V	6 mA
CDP18S624		4K	96h	5 V	13 mA*
CDP18S625	ROM/PROM	8/16/32K	Permanent	5 V	10 mA•

*Operating current with batteries on trickle charge.

• Using eight CDP1834 CMOS ROM's.



CDP18S625 8/16-Kilobyte ROM/PROM

Microboard Memories

CDP18S620
4-Kilobyte RAM

- 4 kilobytes of static RAM (32 MWS5101 256 × 4 RAM's
- Assignable to any 4-kilobyte block in memory space (on 4-kilobyte boundaries)
- Any number may be used within the 64-kilobyte memory space

CDP18S621V1
16-Kilobyte RAM

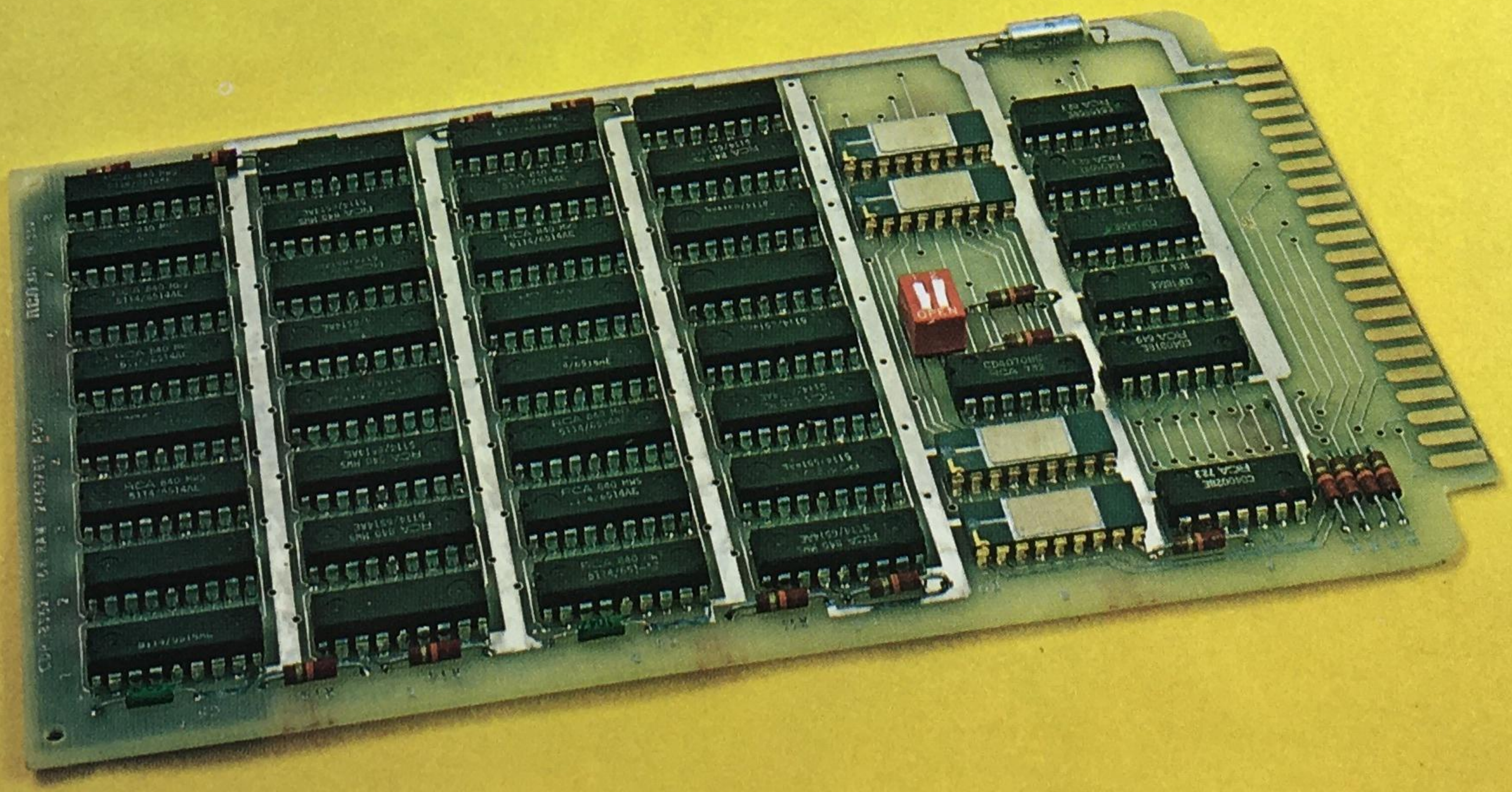
- 16 kilobytes of static RAM (32 NEC445L 1024 × 4 RAM's)
- Assignable to any 16-kilobyte block in memory space
- Up to four boards (64 kilobytes) may be used

CDP18S621
16-Kilobyte RAM

- 16 kilobytes of static RAM (32 MWS5114 1024 × 4 RAM's)
- Assignable to any 16-kilobyte block in memory space
- Up to four boards (64 kilobytes) may be used
- Any 4-kilobyte block may be disabled

CDP18S623
8-Kilobyte RAM

- 8 kilobytes of static RAM (32 512 × 4 RAM's)
- Assignable to any even 8-kilobyte block in memory space
- Up to eight boards (64 kilobytes) may be used
- Any 4-kilobyte block may be disabled



CDP18S621 16-Kilobyte RAM

Microboard Memories

CDP18S622
8-Kilobyte Battery-Backup RAM

- 8 kilobytes of static RAM (16 MWS5114 1024 × 4 RAM's)
- Assignable to any 8-kilobyte block in a 64-kilobyte memory space
- Rechargeable Ni-Cad batteries on board
- 96-hour memory retention with external power off
- Option for powering Microboard computer system from on-board batteries
- Option for on-board voltage regulation

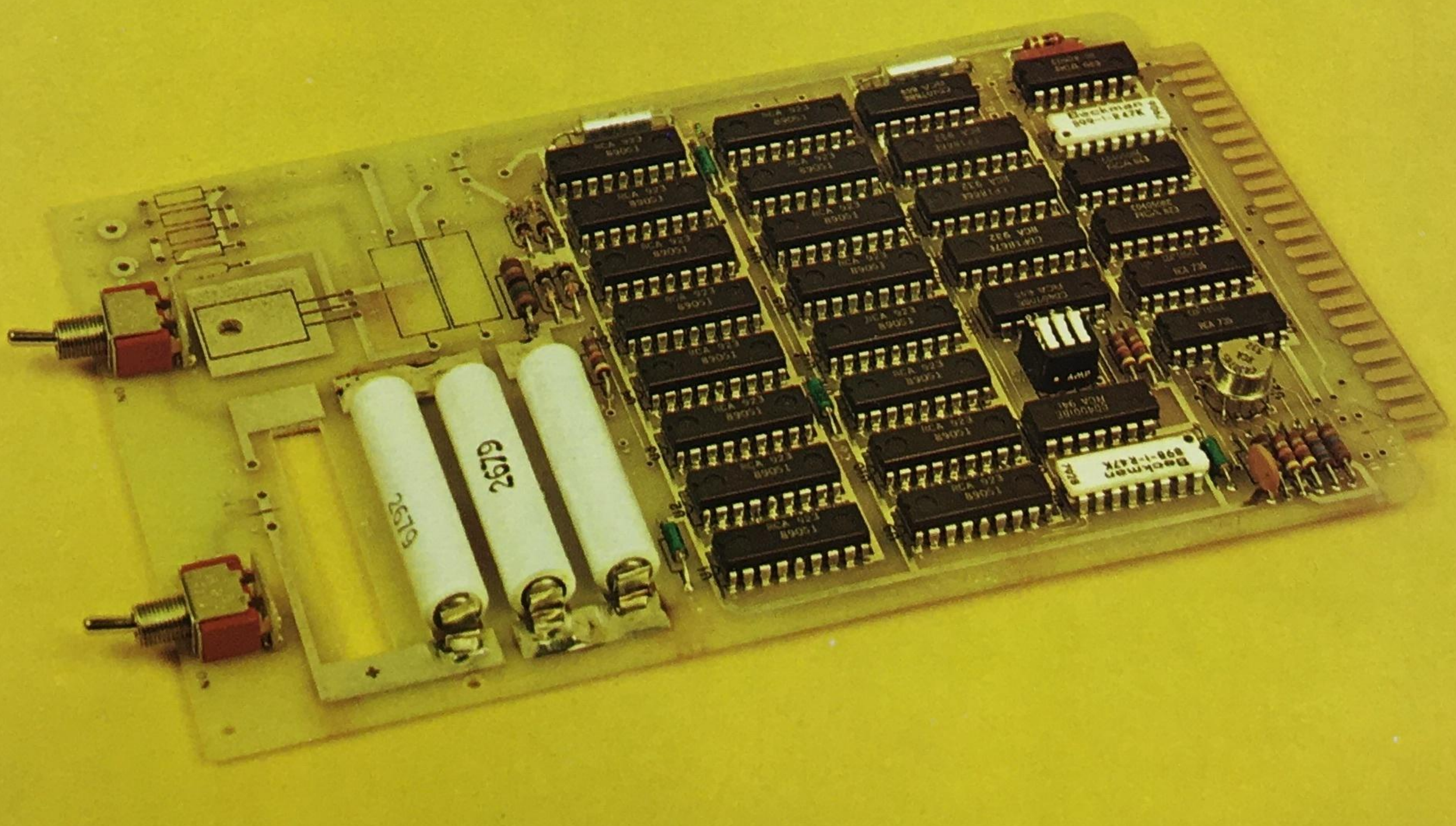
CDP18S624
4-Kilobyte Battery-Backup RAM

- 4 kilobytes of static RAM(16 512 × 4 RAM's)
- Assignable to any 4-kilobyte block in a 64-kilobyte memory space
- Rechargeable Ni-Cad batteries on board
- 96-hour memory retention with external power off
- Option for powering Microboard computer system from on-board batteries
- Option for on-board voltage regulation

CDP18S625
8/16/32-Kilobyte ROM/PROM

- 8 sockets for CDP1834 ROM's or 2758, 2716, or 2732 EPROM's
- Two groups of 4 sockets independently assignable as 4-, 8-, or 16-kilobyte blocks anywhere in 64-kilobyte memory space

For more information on the Microboard Universal Backplane, see page 13.



CDP18S622 8-Kilobyte Battery-Backup RAM

Microboard Expansion Modules

CDP18S640
Control and Display Module

- Provides control and display for any Microboard system
- Four control switches: RESET, RUN PROGRAM, RUN UTILITY, STEP-CONTINUOUS
- Six-digit hex display: four for current memory address, two for current data bus content
- Two ROM/PROM sockets; utility ROM available
- One-page (256-byte) RAM for either utility program or user program
- Interface for Microterminal CDP18S021
- One-page (256-byte) RAM for either utility program or user program

CDP18S641
UART Interface Module

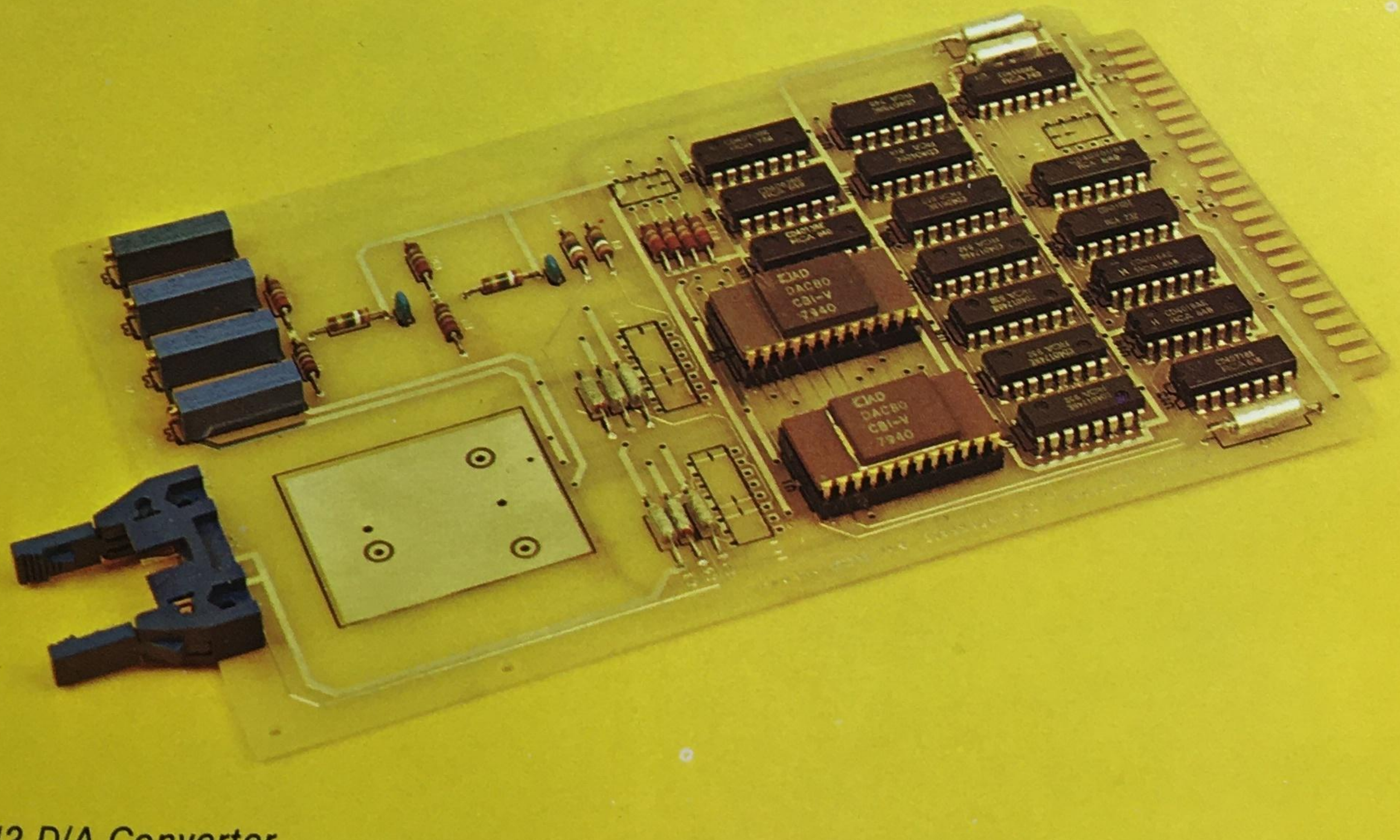
- UART in programmed COSMAC mode (1 CDP1854)
- 20-mA or RS232C serial interface
- Selectable baud rate, 110 through 19,200 baud
- Paper-tape reader run control
- Assignable I/O address
- Low-power CMOS

CDP18S642
D/A Converter

- 12- or 8-bit resolution
- Bipolar or unipolar voltage output
- Settling time of 5 microseconds
- 2 independent D/A channels
- Assignable I/O address
- Requires +15 V and −15 V in addition to +5 V

CDP18S643
A/D Converter

- 8 multiplexed differential inputs
- 16 multiplexed single-ended analog inputs
- Programmable-gain input amplifier
- Sample and hold
- 12- or 8-bit resolution
- Interrupt or polled for conversion complete
- Assignable I/O address
- Requires +15 V and −15 V in addition to +5 V



CDP18S642 D/A Converter

Here's your video flexibility

Microboard Expansion Modules

CDP18S660
Combination Memory and I/O Module

- 40 programmable I/O lines (2 CDP1851's)
- 2-kilobyte static CMOS RAM (4 MWS5114's)
- 4 sockets for up to 8 kilobytes of EPROM (2708, 2758, or 2716) or 4 kilobytes of mask-programmed ROM (CDP1834)
- RAM and ROM independently assignable within memory space
- Assignable I/O addresses

CDP18S659
Microboard Breadboard

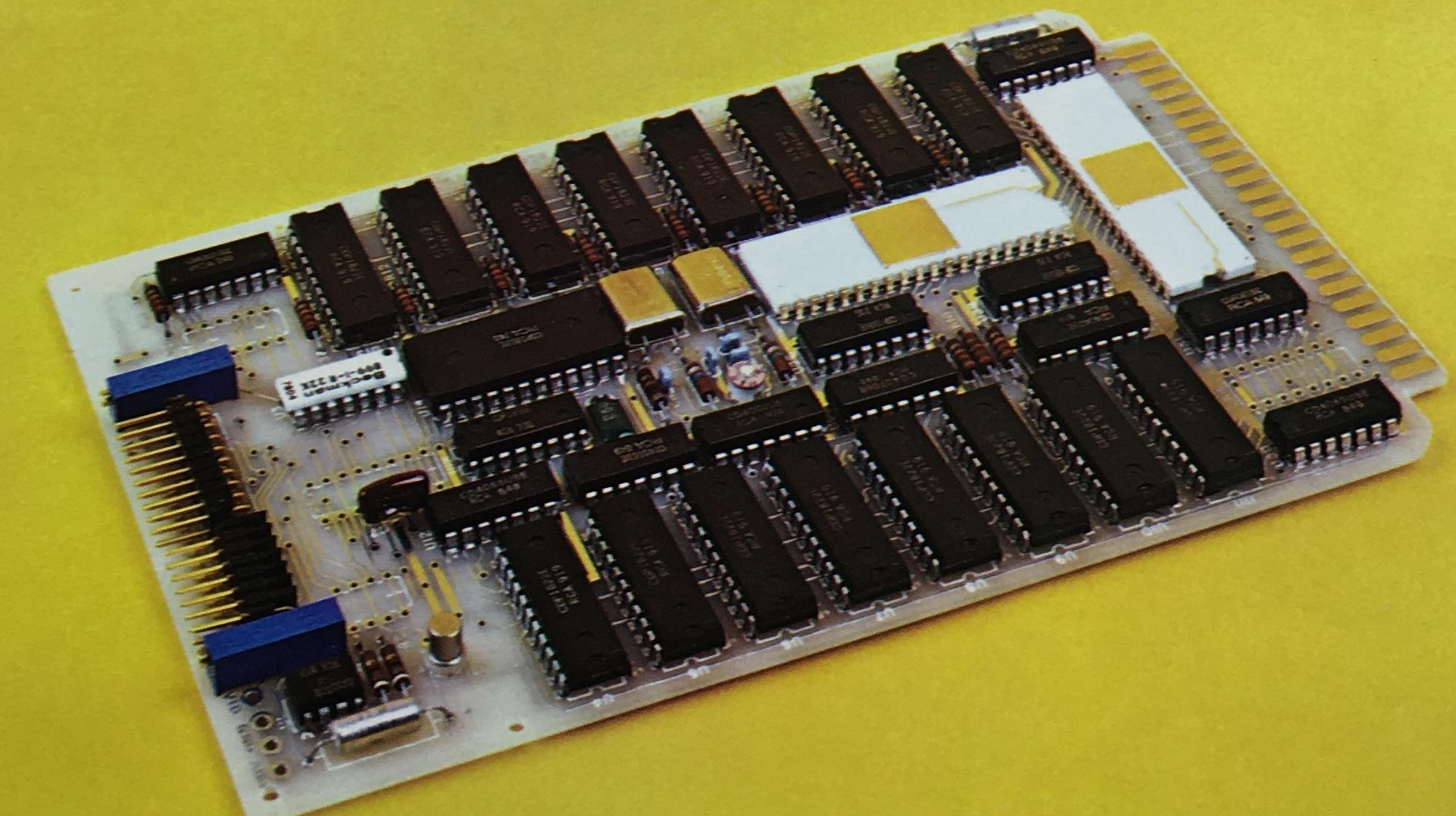
- Blank module for user designs
- Mates with Microboard Universal Backplane
- Printed power supply and ground connections

CDP18S502
Extender Card

- Extends backplane to make Microboard modules accessible
- Facilitates trouble shooting

CDP18S661
Video-Audio-Keyboard Interface

- Uses RCA Video Interface System — CDP1869, CDP1870
- 40 characters per line × 24 lines; or 20 × 12; programmable
- Up to 128 different characters
- Page and character memory on board
- Full color or black and white capability; programmable
- RGB or composite video output
- External syncs for overlay
- Graphics and motion; hardware scroll
- Audio — 8 octaves; 128 tones per octave; white noise; volume control
- Keyboard — parallel port provided
- Firmware support VIS Interpreter CDP18S835
- PAL version available — CDP18S661V3



CDP18S661 Video-Audio-Keyboard Interface

Chassis and Power Supplies

CDP18S670
25-Card Chassis with Case and Power Supply

- Preprinted Microboard Universal Backplane for 20 cards
- 5 additional slots with power and ground only for user-option cards
- Power supply provides 5 V at 6 A; connections for 2 additional voltages
- Metal protective case
- Operates from either 110- or 220-volt supply

CDP18S675, CDP18S676
5-Card Chassis

- Preprinted Microboard Universal Backplane for all 5 cards
- Simple, extremely low-cost structure: consists of backplane and 5 connectors with built-in guides
- Edge connector on backplane for expansion
- Operable with CDP18S023 5-V power converter
- CDP18S676 has protective base and cover

CDP18S023
COSMAC Power Converter

- Regulated +5 Vdc, ±5% at 600 mA
- Input: 120 V, 50-60 Hz, 9 W
- Dimensions: 2.7 × 2.1 × 1.6 inches
- Weight: 12.5 ounces

CDP18S023V3
COSMAC Power Converter

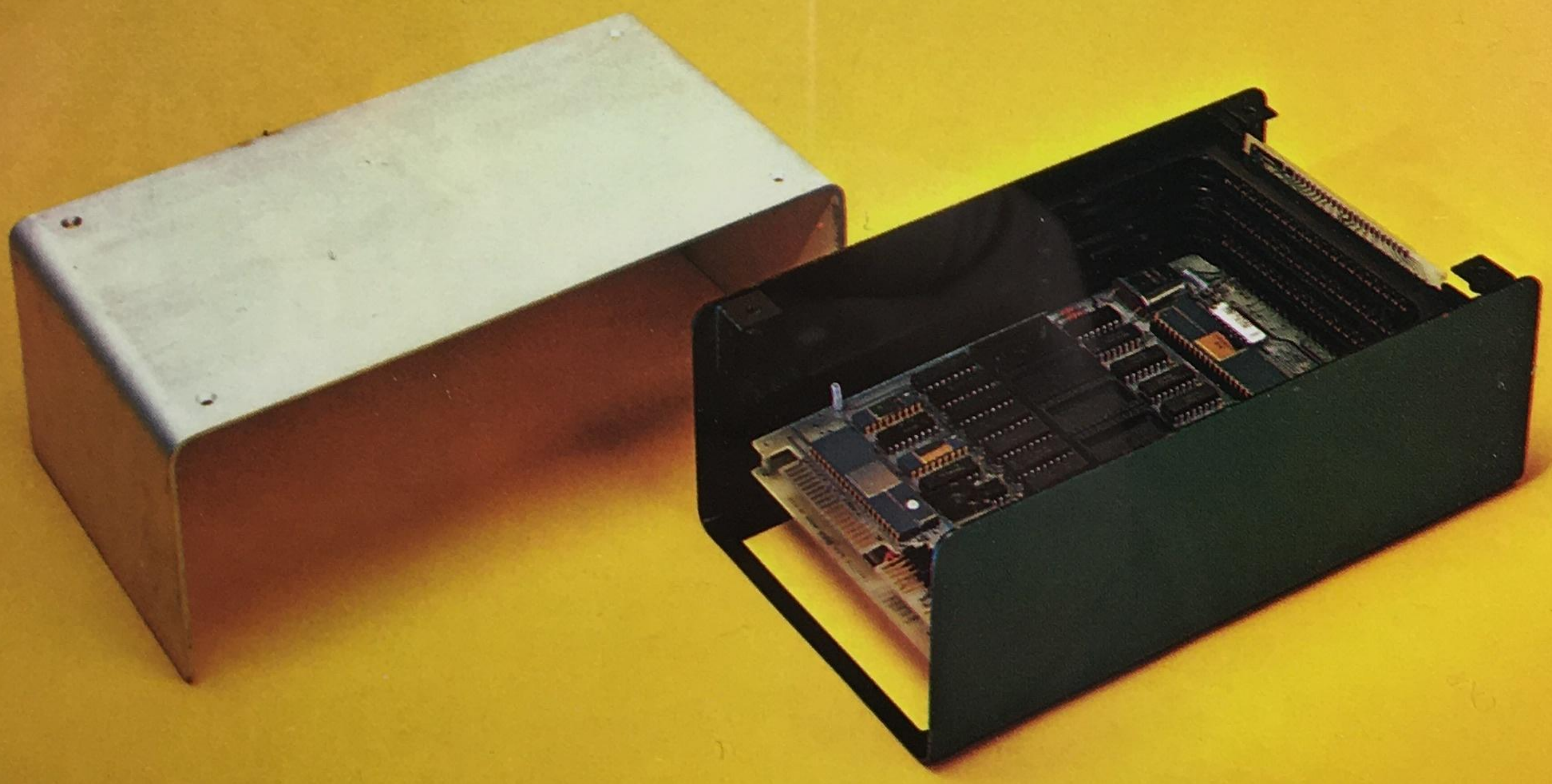
- Regulated +5 V dc, ±5% at 600 mA
- Input: 210-250 V, 50 Hz
- European-type 2-pin molded plug
- Dimensions: 130 × 63.5 × 50.8 mm
- Weight: 482 grams

CDP18S515 TTY CDP18S516 EIA
Terminal Interface Cables

- 15 feet long; plug into CDP18S601, CDP18S602, CDP18S603, CDP18S604, or CDP18S641 serial data port
- CDP18S515 has Molex connector for 20-mA TTY terminal
- CDP18S516 has 25-pin female delta and mating male connectors for EIA RS232C terminal

CDP18S517 I/O Interface Cable

- 36-inch long, 34-pin flat ribbon cable
- Plugs into CDP18S601, CDP18S602, CDP18S603, CDP18S604 parallel I/O port
- Output end unterminated



CDP18S676 5-Card Chassis with Cover

Get off to a fast start with fully assembled

Microboard Prototyping Systems

CDP18S691
Microboard Prototyping System

Includes:

- CDP18S601 Microboard Computer
- CDP18S640 Control/Display Module
- CDP18S675 5-Card Chassis
- Attractive metal protective case
- CDP18S023 Power Converter
- CDP18S659 Microboard Breadboard
- Cables and connectors
- Utility software
- Technical literature

CDP18S692
Microboard Prototyping System

Same as CDP18S691 except that it uses the CDP18S602 Microboard Computer

These Microboard Prototyping Systems have all the features of the RCA COSMAC Microboard Computer Systems shown on page 4, plus:

- Provision of control, display, and utility for any Microboard system
- Four control switches: RESET, RUN PROGRAM, RUN UTILITY, STEP-CONTINUOUS
- Six-digit hexadecimal display: four for current memory address, two for current data bus content
- One-kilobyte ROM for utility program plus ROM/PROM socket
- One-page (256-byte) RAM for either utility program or user program
- Interface for Microterminal CDP18S021
- Regulated power supply
- Fully assembled
- Utility program enhanced with editing commands such as display, substitute, write, move or fill memory

CDP18S691 Microboard Prototyping System

Microboard Universal Bus and Backplane

The Microboard Universal Bus ties into a compact 44-pin (dual 22) connector that fits the Microboard Universal Backplane. The bus contains lines for logic power, analog power, data address, and control. All logic levels swing the full supply voltage, typical of CMOS logic, and thereby provide high noise immunity. The design of the Universal Bus and the associated backplane arrangement allow any RCA CMOS Microboard to plug into any slot. Simple and compact, this interface supports Microboard interchangeability and facilitates the rapid incorporation and evaluation of design changes.

Universal Backplane Signal and Pin Assignment

Component Side				Wire Side			
Pin	**Mnemonic**	**Signal Flow**	**Description**	**Pin**	**Mnemonic**	**Signal Flow**	**Description**
A	TPA-P	Out	System Timing Pulse 1	1	DMAI-N	In	DMA Input Request
B	TPB-P	Out	System Timing Pulse 2	2	DMAO-N	In	DMA Output Request
C	DB0-P	In/Out	Data Bus	3	RNU-P	—	Run Utility
D	DB1-P	In/Out	Data Bus	4	INT-P	In	Interrupt Request
E	DB2-P	In/Out	Data Bus	5	MRD-N	Out	Memory Read
F	DB3-P	In/Out	Data Bus	6	Q-P	Out	Programmed Output Latch
H	DB4-P	In/Out	Data Bus	7	SC0-P	Out	State Code
J	DB5-P	In/Out	Data Bus	8	SC1-P	Out	State Code
K	DB6-P	In/Out	Data Bus	9	CLEAR-N	In	Clear-Mode Control
L	DB7-P	In/Out	Data Bus	10	WAIT-N	In	Wait-Mode Control
M	A0-P	Out	Multiplexed Address Bus	11	− 5 V/ − 15 V	—	Auxiliary Power
N	A1-P	Out	Multiplexed Address Bus	12	SPARE	—	Not Assigned
P	A2-P	Out	Multiplexed Address Bus	13	CLOCK OUT	Out	Clock from CPU Osc.
R	A3-P	Out	Multiplexed Address Bus	14	N0-P	Out	I/O Primary Address
S	A4-P	Out	Multiplexed Address Bus	15	N1-P	Out	I/O Primary Address
T	A5-P	Out	Multiplexed Address Bus	16	N2-P	Out	I/O Primary Address
U	A6-P	Out	Multiplexed Address Bus	17	EF1-N	In	External Flag
V	A7-P	Out	Multiplexed Address Bus	18	EF2-N	In	External Flag
W	MWR-N	Out	Memory Write Pulse	19	EF3-N	In	External Flag
X	EF4-N	In	External Flag	20	+ 12 V/ + 15 V	—	Auxiliary Power
Y	+ 5 V	In	+ 5 volts dc	21	+ 5 V	In	+ 5 volts dc
Z	GND	In	Digital Ground	22	GND	In	Digital Ground

RCA Microboard Warranty

RCA warrants, in accordance with its standard terms and conditions of sale, that its products, at the time of shipment by RCA, or RCA appointed Solid State Distributor, will be free from all defects in both materials and workmanship and will conform to RCA applicable specifications when operated within the operating conditions set forth therein for a period of 90 days from the date of shipment from RCA or an RCA appointed Solid State Distributor.

RCA will repair or replace, at its option, any Microboard product having defects in materials or workmanship that occur under normal use within the warranty period.

For complete Terms and Conditions of Sale, including warranty information, please contact your local RCA Solid State Division Sales Office or write to: RCA Solid State Division, Box 3200, Somerville, N.J. 08876.

In Europe, RCA supplies Microboards and other systems products primarily through its appointed systems distributors and agents. In some countries, the warranty period differs from that set out above. For details of the warranty terms offered in your area, please contact your local RCA appointed distributor or RCA s.a., Mercure Centre, Rue de la Fusee 100, 1130 Brussels, Belgium.

RCA Microboard Exchange Plan

To provide an expedient repair service for Microboard products out of warranty, RCA offers its customers a factory exchange plan. For details and cost, please consult your local RCA Solid State Division Sales Office or Appointed Distributor.

Here are your hardware and software design aids

Microboard Systems Support

CDP18S007
COSMAC DOS Development System

- Microboard compatible
- Includes disk file management and operating system
- Accelerates software and hardware development
- 28 kilobytes of user-accessible RAM
- Dual-drive floppy disk system for mass-memory storage
- Editor, Level II Macroassembler and diskette utility programs
- Enhanced file protection
- Binary file loading capability for speed and storage economy
- 19-inch rack-mountable chassis
- Printed circuit backplane accommodates all Microboard modules
- Internal power supplies; 2.5-MHz clock
- Front panel with controls and displays
- 6 plug-in modules plus 28-kilobyte memory modules
- Four spare memory PC module positions
- Nine spare I/O module positions
- Easy to customize
- 20 mA and RS232C data terminal interfacing
- Switch-selectable baud rates of 110, 300, 1200, 4800, 9600, or 19200 baud
- Full- or half-duplex operation

. . . and more

CDP18S005
COSMAC Development System (CDS II)

- Microboard compatible
- For use with cassettes and paper tape
- Upgradable to CDP18S007
- 4 kilobytes of static RAM
- Resident editor and assembler
- Resident ROM-based utility program
- Front panel with controls and displays
- Internal power supplies; 2-MHz clock and more

CDP18S021
Microterminal

- Hand-held, fully assembled, portable data terminal
- Low-cost alternative for TTY, CRT, or other terminal in CDP1802-based systems

CDP18S834
Basic 1 Compiler/Interpreter

- High-level language easily learned
- Simplifies and accelerates program development on CDP18S007
- User can develop or run programs in Basic 1 directly, or
- Convert programs to faster-running executable object code
- Extendable by addition of machine language routines
- Line number flexibility
- Floppy disk program storage through interpreter statements
- Compiler translates stored Basic 1 program into assembly language
- Line numbers from 1 to 32767
- Multiple statements per line allowed
- Numbers in hex (#0000 to #FFFF); in decimal (−32767 to +32767)

CDP18S839
PLM 1800 High-Level-Language Compiler

- High-level language easily written, read, and maintained
- Control structures and procedures allow structured approach to software problems
- In-line assembly code permitted
- Complex arithmetic and conditional expressions
- Recursive and function procedures
- Scoped language
- Applications oriented
- Works with COSMAC DOS Development System CDP18S007

Plus a lot of great technical literature

Microboard Systems Support

CDP18S826 Fixed-Point CDP18S827 Floating-Point Binary Arithmetic Subroutines

- Works with Microboard and other CDP1800-based systems
- Includes arithmetic functions, format conversion, and utility routines
- 16-bit 2's-complement arithmetic routines with double-precision capability (CDP18S826)
- 32-bit arithmetic plus sine, cosine, arctan, natural log, e^x, and square root (CDP18S827)
- Available on disk, tape, and cassette
- CDP18S826 also available on ROM

CDP18S030
COSMAC Micromonitor

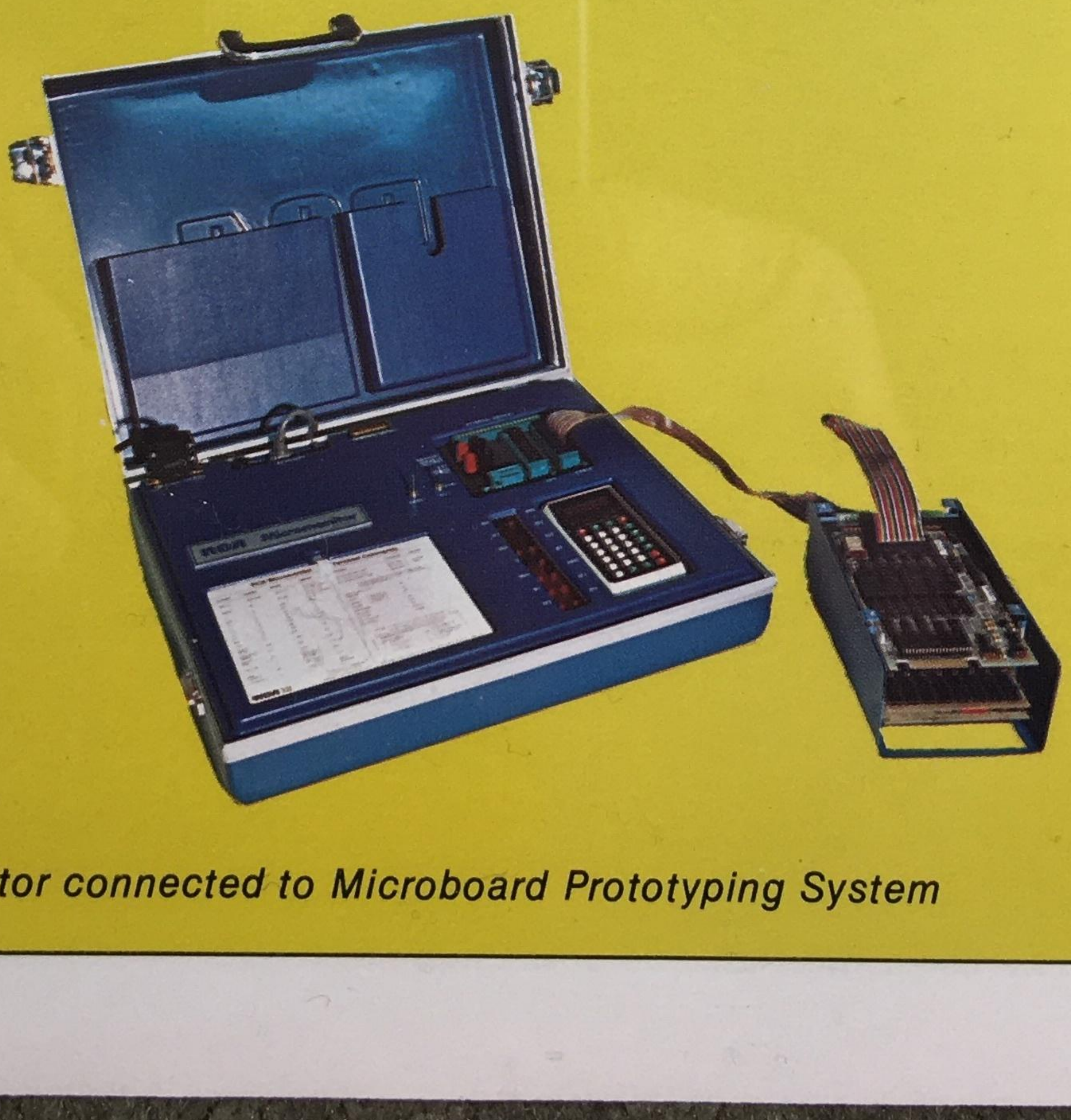
- For in-circuit real-time hardware/software debugging
- Stand-alone operation; self-contained; portable
- Single connection to any CDP1800 system
- 45 separate debug commands
- For field servicing and production testing
- Uses microprocessor of system under test — not emulation
- Built-in keyboard and display
- 20 mA or RS232C terminal interface
- Data logs several CPU registers at user-determined points
- Built-in tracking power supply

CDP18S480
PROM Programmer

- Works with Microboard and CDP18S007 systems
- Programs Intel 2704, 2708, 2716, 2758
- Reads Intel 1702-type PROM's
- Includes Programmer Microboard
- Versatile operating program in source and assembly language
- Available on disk, paper tape, and cassette

CDP18S831
Micromonitor Operating System (MOPS)

- Enables disk-operation of Micromonitor
- Down loads from disk to user RAM
- Enables disk-file control of Micromonitor for production testing
- Debug sessions can be recorded on disk
- System state can be saved on disk for later reload
- Extends Micromonitor debugging commands
- Includes operating system disk, UART plug-in module, and cables



CDP18S030 Micromonitor connected to Microboard Prototyping System

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